

Mr. G. J. Burch showed a series of photographs of the excursions of a very sensitive capillary electrometer when projected on to a rapidly travelling plate and actuated by speaking into a telephone placed in the circuit. The excursions formed the basis for calculations of the E.M.F. of such telephone currents as are produced by the sounds of ordinary conversation; this varied from '05 to '1 of a volt, but with louder sounds might be sufficient to produce electrolysis. Photographs were shown which demonstrated that the instrument used could respond to changes of potential difference when these occurred one after another at a rate of nearly 3000 double vibrations in one second. The effect of the sounds of certain vowels and consonants were shown, such as *ah*, *ee*, *z*, and *r*. In each case the fundamental tone of the voice and some of its harmonics combined to give a characteristic electrometer excursion with higher rapid vibrations superimposed upon it. These in the case of *z* were just visible under a lens, and appeared to have a rate of 3000 in one second. Photographs were also shown of the characteristic excursion caused by the pronunciation of the words, "Pop, pop," and "Dod, dod," the difference between the labial and the dental being well marked. Finally another series of photographs was exhibited which demonstrated that when electrolysis occurs in the electrometer, and the evolution of the gas recorded on the travelling photographic plate, this evolution is seen to take place without any measurable delay the instant the electrolysing current commenced.

BRITISH ASSOCIATION CONFERENCES OF THE DELEGATES OF THE CORRESPONDING SOCIETIES.

THE meetings of the Conference of Delegates were held at the New Examination Schools. Forty-two societies nominated delegates to represent them at the Conference.

FIRST CONFERENCE, AUGUST 9.

The Corresponding Societies' Committee was represented by Prof. R. Meldola (chairman), Prof. T. G. Bonney, Sir John Evans, Sir Douglas Galton, Dr. Garson, Mr. Hopkinson, Mr. Cuthbert Peek, Sir Rawson Rawson, Mr. Symons, Mr. Topley, Mr. Whitaker, and Mr. T. V. Holmes (secretary).

The Chairman remarked that this was their tenth Conference. Hitherto the reports of these Conferences had always been a year behind, as regards their publication in the British Association volume; the report of the Conference held at Edinburgh in 1892, for example, appearing in the volume giving an account of the proceedings at Nottingham in 1893. Steps had been taken to prevent this delay in future. They had also taken a new departure in announcing beforehand that some special subject would be discussed at the Conference. On that occasion they had been fortunate enough to secure the attendance of Mr. Cuthbert Peek to open a discussion on Local Museums.

Mr. Cuthbert Peek dealt with the subject under the following headings:—

- (1) Methods of registration and cataloguing.
- (2) The protection of specimens from injury and dust.
- (3) The circulation of specimens and type collections for educational purposes.
- (4) Central referees for nomenclature and classification.
- (5) The most satisfactory methods of making museums attractive.

(6) Museum lectures and demonstrations.

(7) The relations between museums and County Councils.

(1) For small museums he thought a card catalogue was the best. Sectional letters should distinguish the various classes of objects. Each specimen, when received, should have a number under the letter of the section assigned to it, painted on the specimen. It was a good thing to have the dimensions of the specimen, with a rough outline of it, on the back of the card.

(2) Every closed case was acted upon by changes in the pressure of the atmosphere, so that it drew in and gave out air and dust with every change of pressure. It was desirable to admit air into each case by means of an opening filled with cotton-wool, or some similar material, so that the air entering might be filtered.

(3) At Liverpool a system had been elaborated by which loan-collections were prepared and circulated among a large

number of schools. Each collection contained some special class of objects, such as food products, woods, &c. Those wishing to organise a plan of this kind should consult a paper by Mr. J. Chard, in the Report of the Museums' Association for 1890.

(4) The average curator of a small museum was often in difficulties as to the correct names of certain specimens. An organisation of specialists who would, for a small fee, allow specimens to be forwarded to them for identification, would be of the greatest use.

(5) While there were many well-arranged and attractive museums, there were others dusty, with labels illegible or invisible, which were almost unvisited and unknown. The English as well as the Latin names of specimens should be given. Much might be done to exhibit the variations of structure in creatures of different families or genera. Thus, in the Natural History Museum, South Kensington, there had recently been placed the skeletons of a man and of a horse, both in the attitude of running, so that the relations of the two, bone for bone, could be distinctly seen. The surgical, ordinary, and veterinary names of the bones were added.

(6) It was extremely difficult to make a museum demonstration useful to more than about a dozen persons. One experienced demonstrator had suggested that a lecture should be given in an ordinary lecture-room, illustrated by specimens, &c., to the whole of a large gathering, and a case-demonstration afterwards to the few seeking further information. The demonstrator should be placed on a temporary stand, so that he might see, and be seen by, his audience.

(7) It had always appeared to him that demonstrations in museums should take a very prominent part in technical instruction, and he had been surprised that so little aid had been given by County Councils to museums. Having sent out a circular to County Council Technical Education Committees, he had found that local museums and free libraries had been assisted in only nine cases. From some counties no information had yet been received, but it would appear from the answers received that there was no insuperable obstacle to the application of money intended for technical education to the development of museums.

In conclusion, Mr. Peek drew attention to the magnificent museum founded at Oxford by General Pitt-Rivers, the arrangement of which was unique.

The Chairman thought they were greatly indebted to Mr. Peek, and invited discussion.

Sir John Evans said that Mr. Peek had left but little for any one to add. He approved of the card catalogue, but thought that the American system of having a perforated card through which a wire passed might perhaps be preferable. He would be glad to know the best way of keeping a cabinet free from dust. He had tried a lining of cotton-wool, but did not think the result perfectly satisfactory. As regards referees for nomenclature and classification, he would suggest the keepers of the various departments of the British Museum, who would always give prompt and valuable assistance.

The Rev. O. P. Cambridge, having a large collection in spirits of wine, had found that the best place for the labels was inside the glass jars, not outside. The writing should be with a pencil.

Sir Rawson Rawson had not always found pencil-marks indelible; and the Rev. O. P. Cambridge added that the pencil should be neither very hard nor very soft.

Dr. Garson could corroborate what had been said as to the advantages of using pencils in spirit preparations. Mr. Gray remarked that variation in the aspect of a museum constituted a most important element of attraction. The circulation of specimens tended, in itself, to make a museum attractive.

Mr. T. W. Shore hoped that Conference might do something towards obtaining aid for museums from County Councils. It was clear that grants could be made by County Councils to defray the expense of lectures and demonstrations in museums.

Mr. Sowerbutts remarked that though County Councils might be subject to the Government auditor, boroughs were not; and Mr. Kenward said that at Birmingham the Corporation had established a museum and art gallery without any help from the County Council.

Mr. T. V. Holmes had in his hands a letter from Mr. W. Cole, secretary to the Essex Field Club, who was most intimately acquainted with technical education as it existed in Essex. Mr. Cole's experience had given him a very low notion

of the efficacy of mere lecturing. A lecturer brought specimens with him, but with the departure of the lecturer the specimens also departed. What was wanted was (Mr. Cole thought) a permanent central museum continually sending forth loan collections to the remoter districts, the collections being allowed to remain a certain time after the lectures illustrated by them had been given. He did not think County Councils should have the entire control of museums, as that would greatly diminish the interest taken in them by the naturalists and field clubs to whom they usually owed their existence. But a grant from the County Council would give a permanence to a museum which would immensely increase its efficiency in every way.

After some discussion, in which Dr. Brett, Sir Douglas Galton, Mr. Gray, Sir John Evans, Mr. Cushing and Mr. Whitaker took part, the following resolution was proposed by Sir Douglas Galton, and seconded by Dr. Brett:—

"That in the opinion of this Conference it is desirable that local natural history societies, and those in charge of local museums, should place themselves in communication with the Technical Instruction Committee of the county or borough in which they are placed, with the view of obtaining pecuniary grants towards extending technical knowledge by means of lectures or by demonstrations in museums."

Mr. Coates stated that at Perth they were building a large addition to their museum, and had obtained a grant from the County Council on condition that they provided specimens suitable for agricultural teaching.

Mr. Elworthy said that a difficulty felt by many had not been touched upon. They needed the services of an expert who would visit a museum and pronounce with authority, "this is rubbish," in the case of worthless specimens. A secretary would seldom venture to get rid of rubbish on his own responsibility.

Sir John Evans thought the opinion of the secretary should be deemed sufficient.

The Chairman then put the resolution to the meeting, and it was unanimously adopted. On asking if any delegates had any other remarks to make,

Mr. Seward, of Cardiff, was anxious to know, if possible, what things bought for a museum in order to make it more useful and attractive to the poorer classes might be legally purchased under the Act.

Sir John Evans said that it seemed to him that the last resource in these cases was the Science and Art Department at South Kensington.

The Chairman thought the Conference could not possibly attempt to decide the point raised by Mr. Seward. He felt sure that all present were most grateful to Mr. Peek for having opened this discussion on museums, which, he believed, would lead to most useful results.

SECOND CONFERENCE, AUGUST 14.

The Corresponding Societies' Committee was represented by Prof. R. Meldola (chairman), Dr. Garson, Mr. Hopkinson, Sir Rawson Rawson, Mr. Symons, Rev. Canon Tristram, Mr. Whitaker, and Mr. T. V. Holmes (secretary).

The Chairman hoped that delegates would do their best to further the resolution passed at their last meeting, with regard to local museums.

SECTION A.

Meteorological Photography.—Mr. Clayden stated that a sufficient collection of photographs had been received, except that he would be glad of photographs of lightning showing anything abnormal. Sometimes he read of the remarkable effects of a whirlwind in some district when it was too late to obtain photographs of its results. In such cases he would be glad if the secretary of some local society could get photographs taken at once, and send them to him before it was too late. In reply to Sir Rawson Rawson, he said that he had seen the photographs of storms and lightning exhibited by the Royal Society, and believed he had many of them.

Mr. Symons remarked that much help could be given by local societies if they were to send reports in.

Earth-tremors.—Mr. Davison said that in the last report of the Earth-tremors Committee there was a description of a bifilar pendulum invented by Mr. Horace Darwin. It had also been described in NATURE for July 12. It was especially desirable that instruments for registering earth-tremors should be placed along the course of great lines of fault (dislocations of the strata).

Mr. Horace Darwin then explained the construction of his bifilar pendulum for registering earth-tremors. It was not, he said, affected by the rapid, complicated movements which took place during an earthquake, nor by the slight tremors caused by passing carts or trains. But extremely slight movements of the kind which would make a factory chimney lean to one side would be registered.

Mr. Symons, as chairman of the Earth-tremors Committee, explained how the work of the Committee had grown, and in what respect it needed additional help. A series of pulsations which had been recorded by an instrument placed at the bottom of one of the deepest mines in the district of Newcastle-on-Tyne had been traced to two causes—the gradual settlement of the ground in consequence of the removal of the coal, and the beating of the waves on the coast. They had since been looking for traces of earthquake tremors. Mr. Davison on one occasion watched his instrument for some time, as he found pulsations were taking place. They turned out to have been produced by the earthquake then going on in Greece. They wanted information as to the changes going on in connection with the faults in geological strata, and, if possible, to get records of the alterations in the earth's crust caused by tidal waves. The work was then going on at Birmingham under Mr. Davison, but they were anxious to have instruments established in other parts of the British Isles. In answer to Mr. Tiddeman, Mr. Symons said that an instrument could be placed on the floor of a cellar. Mr. Horace Darwin had kindly undertaken to explain its mechanism at the close of the Conference.

The Chairman hoped that some of the corresponding societies would have something to report on this question next year.

SECTION B.

Pollution of Air in Towns.—Dr. G. H. Bailey said that for three or four years they had been engaged in Manchester, in connection with the Manchester Field Naturalists, in examining the air of towns. The amount of pollution and the amount of the death-rate varied together. They had almost perfected a method for determining the amount of sulphur compounds in the air, and one for measuring the amount of sunlight in towns. Their work had been chronicled in the *Journal* of the Manchester Field Naturalists for 1893.

Mr. Slater made a few remarks on the effects of smoke on plants, and the Chairman added that cryptogams and lichens were once common on trees in Epping Forest. London had now approached too near for them to flourish.

SECTION C.

Mr. Whitaker (representing Section C) said that he would first refer to coast-erosion. The final report on this subject would be made, he hoped, next year. The subject would then be handed over to the local societies, and those which had coast borders could continue the work by recording changes on six in maps. As regards the Committee on the Circulation of Underground Waters, its final report would also be made next year. In this case, also, the local societies could continue the investigation. It had been suggested that the twenty reports should have their contents arranged topographically, and that if then published, as a volume of 250 to 300 pages, many local societies might be glad to purchase it.

Erratic Blocks.—Mr. Murdoch regretted that the labours of the Erratic Blocks Committee were confined to England and Ireland. The work in Scotland had not been so nearly finished as was commonly supposed. Mr. Gray said that in Ireland they had issued their first Report on Erratic Blocks.

Prof. J. F. Blake stated that he was engaged in examining the microzoa of clays, especially of Jurassic clays, and would be glad if members of the corresponding societies could send him samples. He would gladly report to senders on the general character of these clays and their microzoa. He might take that opportunity of telling the delegates that unless he could obtain more support for the *Annals of British Geology* he could no longer afford to publish it.

Mr. Whitaker hoped that Mr. Blake's remarks would prevent the cessation of that most useful work.

Geological Photographs.—Mr. Jeffs said that the committee had received 1055 photographs, and had passed a resolution recommending the Council of the British Association, whose property the collection was, to deposit it in the Museum of Practical Geology, Jermyn Street, London.

SECTION E.

Mr. Sowerbutts said that the Manchester Geographical Society had come to the conclusion that geography would never be taught satisfactorily in primary schools unless it was made a compulsory subject. Progress had been made in some primary schools by the institution of school-museums. It was a singular fact that at an examination in geography of the primary schools of Cheshire, Lancashire, and Yorkshire, the girls had won all the prizes in Yorkshire, and the boys in Lancashire. His Society had for the last two or three years published an analysis of the chief geographical papers which had appeared in English and foreign journals.

SECTION H.

Ethnographical Survey.—Mr. Brabrook remarked that during the past year their list of suitable villages had been considerably increased, and now numbered 367. At Ipswich a sub-committee had been formed to assist them, and at Liverpool the keeper of the museum had given most valuable help. In Wales their sub-committee had met and had done good work, and the same remark might be made of Ireland. In Scotland they had a promise of assistance from the Glasgow Archaeological Society. They had been told that their instructions about photographing were too minute, but they had been drawn up by Mr. Francis Galton with reference to his system of composite photographs, and any departure from them would make the application of that system comparatively difficult.

Mr. Sowerbutts stated that old people in his district objected to be photographed and measured.

Dr. Garson said that as regards photographs it was not necessary to get all the appliances Mr. Galton had mentioned. It was desirable to have a seat which could be raised or lowered like a piano-stool, so that each person might have his head in the same place, whatever his height might be. It was well, also, to have chalk lines on the floor at right angles to each other, the sitters being directed to look along either one line or the other. They did not want measurements of people more than fifty years old.

Mr. Brabrook added that a set of instruments for measurements might be had for £1 6s., and a more expensive set for £3 3s. And Dr. Garson remarked that the cheaper set was quite good enough.

A vote of thanks to the chairman closed the proceedings.

SCIENTIFIC SERIALS.

Proceedings of the Edinburgh Mathematical Society, vol. xii. (Williams and Norgate, 1894).—The geometrography of Euclid's problems, by Dr. J. S. Mackay, is a modification of M. E. Lemoine's *La Géométrie graphique ou l'art des constructions Géométriques* (the subject of two memoirs read at the Oran (1888) and Pau (1892) meetings of the French Association for the Advancement of the Sciences), and an application of it to the problems in the first six books of Euclid's "Elements." The restrictions are those of Euclid, viz. that the constructions should be effected by means of the straight-edge and compasses only. It is an interesting introduction of M. Lemoine's methods to English readers. The same author contributes formulæ connected with the radii of the incircle and the excircles of a triangle. This is on the lines of the work we recently noticed by the same writer (vol. i. *Edin. Math. Soc. Proceedings*). It is founded upon a table given in the *Lady's and Gentleman's Diary* for 1871. Nearly all of the eighty formulæ are assigned to the authors who first published them: possibly those unassigned are due to Dr. Mackay himself. M. Paul Aubert, in his "Coordonnées Tangentielles," applies them to the discussion of a number of general problems relating to surfaces of the second order.—Dr. Sprague writes on the geometrical interpretation of i^2 ; his investigation was suggested by a result given in Hayward's "Vector Algebra and Trigonometry."—Mr. G. A. Gibson, in a proof of the uniform convergence of the Fourier Series, with notes on the differentiation of the series, discusses a point which has not, apparently, been considered in the English text-books.—In addition to the above papers, there are several short notes: Prof. Crum Brown gives an abstract of a paper (to appear) in the *Transactions of the Royal Society of Edinburgh*, on the division of a parallelepiped into tetrahedra; notes on factoring, J. W. Butters; on a problem in

tangency, G. E. Crawford; on certain maxima and minima, G. Duthie; on solutions of certain differential equations, F. H. Jackson; on E. Carpenter's proof of Taylor's theorem, R. F. Muirhead; notes on the number of numbers less than a given number and prime to it, and on the pedal triangle, Prof. Steggall; five notes, viz. two circular notes, geometrical note (ii.), two triplets of circum-hyperbolas, three parabolas connected with a plane triangle, and notes on an orthocentric triangle, R. Tucker; and a note, by W. Wallace, on a third mode of section of the straight line. Of the other communications that were made to the Society during the session the titles only are given. A list of members and of the presents made to the library close the volume, which contains a good deal of matter of interest to mathematical teachers.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 7.—"On the Recurrent Images following Visual Impressions." By Shelford Bidwell, F.R.S.

The earliest recorded observation of a certain curious phenomenon associated with optical after-images is that of Prof. C. A. Young, who published a note on the subject in the year 1872, and proposed that the phenomena should be called "recurrent vision." (*Phil. Mag.* vol. xliii. 1872, p. 343). He noticed that when a powerful Leyden jar discharge took place in a darkened room, any conspicuous object was seen twice at least, with an interval of a little less than a quarter of a second; often it was seen a third time, and sometimes even a fourth.

A few months later an account of two experiments on the same subject was published by Mr. A. S. Davis. (*Phil. Mag.* vol. xlv. 1872, p. 526). In the first, a piece of charcoal, one end of which was red-hot, was waved about so as to describe an ellipse or circle a few inches in diameter. A blue image of the burning end was seen following the charcoal at a short distance behind it, the space between the charcoal and its image being absolutely dark. The other experiment was made with a piece of apparatus resembling a photographic instantaneous shutter. The shutter was interposed between the observer's eye and the sky, and was covered with pieces of coloured glass, through which momentary flashes of light were allowed to pass. It was found that each flash was, after a short interval, generally succeeded by a recurrent image, the colour of which was nearly complementary to that of the glass.

In 1885 the author called attention to a very simple and effective method of exhibiting a recurrent image (*NATURE*, vol. xxxii. 1885, p. 30). If an ordinary vacuum tube, illuminated by an induction coil discharge, is made to rotate slowly upon a horizontal axis fixed at right angles to the middle of the tube, the tube is seen to be followed at a distance of a few degrees by a ghost-like image of itself, the ghost exactly imitating the original in form, but having a uniform steel-grey colour. In the same paper the following observation is noted:—"The vacuum tube being at rest in a feebly lighted room, I concentrated my gaze upon a certain small portion of it while the discharge was passing. The current was then interrupted, and the luminous image was almost instantly replaced by a corresponding image which appeared to be intensely black upon a less dark background. After a period, which I estimated at from a quarter to half a second, the black image again became luminous; this luminous impression lasted but for a small fraction of a second, and the series of phenomena terminated with its disappearance. . . . It was also found desirable to make the preliminary illumination as short as possible, a single flash being generally sufficient to produce the phenomena." The following comment was added:—"The series of phenomena seem to be due to an affection of the optic nerve which is of an oscillatory character. Abnormal darkness follows as a reaction after the luminosity, and again after abnormal darkness there is a rebound into feebler luminosity."

The subject has recently attracted much attention in connection with the experiments of M. Aug. Charpentier. The account of them given by M. Charpentier in a paper on "Retinal Oscillations"¹ is briefly as follows:—"If a black disk having a white sector is illuminated by a strong light, and slowly turned round while the observer's eye is fixed upon its

¹ "Oscillations rétinienne," *Comptes Rendus*, vol. cxiii. 1891, p. 147. See also "Réaction oscillatoire de la Rétine," *Arch. de Physiologie*, 1892, p. 541.